Impact of Applying Aggregate Query Processing in Mobile Commerce

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ABSTRACT

With the increased usage of mobile devices, society is seeing more and more users doing transactions wirelessly. Often, data from a single server may not be sufficient. Rather, data may need to be manipulated and to be gathered from multiple remote servers before useful information can be formed. Mobile transactions are constrained by small screen size of mobile devices, high communication cost, and high memory consumption. Existing techniques from traditional query processing in distributed environments cannot be directly applied to mobile environments. In this paper, the authors propose techniques for processing mobile queries that address the issue of high memory consumption. A set of walkthrough examples was provided and performances of various techniques were examined. The results show that the technique of first downloading primary keys only from one server and then sending a query to the second server using these primary keys before processing for qualified match in the second server gives the best performance.

Keywords: Aggregate Query, Mobile Commerce, Mobile Databases, Mobile Devices and Location-Dependent, Mobile Query Processing

INTRODUCTION

With the increasing usage of mobile devices to perform transactions on the go, all retailers should incorporate m-commerce into their existing business models. M-commerce integrates the technology of mobile devices with existing business processes supported by robust wireless and mobile networks (Snowden et al., 2006; Mohd & Osman, 2005). M-commerce has many advantages over traditional e-commerce. Among them are ease of accessibility, and dynamic as well as nomadic usage. Essentially, mobile users can access real time information anytime depending on their current locations and are free to move from one place to another with continuous connections.

Service providers play an important role in offering users an enjoyable experience when dealing with m-commerce applications (Haim et al., 2011). They are responsible to provide smooth network connections to prospective customers. In order to optimize user experience, service providers have to ensure that background operations of any mobile transactions especially that of information gathering

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take place smoothly without users noticing it. This means low memory consumption, quick response rate, and low communication cost. A good information service thus becomes a necessity (Myers & Beigl, 2003; Prabhakara, Hua, & Jiang, 2000).

In the process of information gathering, there are times when queries are sent to multiple non-collaborative databases. In order to obtain more refined information, aggregate operation has to be performed on the join results. These operations include sum, count, max, min, and average. For example, a mobile user who is interested in buying a computer wants to do a price comparison between two online retailers. He downloads two lists of current deals from the respective online retailers onto his/her device. As the requests are now obtained from two different sources, both lists of the computer deals may be different. Based on these two lists, he performs an aggregation operation on his mobile device to show only those computers that fit his requirements and budget. The user may have other preferences in manipulating the results.

Given the different nature between traditional query processing and mobile location dependent query processing, techniques from traditional query processing in distributed environments cannot be directly applied to mobile environments (Lee et al., 2002). This is because in a typical mobile environment, it involves not only nomadic clients who move around but also non-collaborative servers maintained by different organizations (Lo et al., 2004). Since servers may be just independent service providers, often these servers are specialized within the domain.

The work presented in this paper is part of a larger research project for on-mobile location-based processing in conjunction with processing data that are obtained from different locations. In this paper, we extend our existing algorithms (Lim, Taniar, & Srinivasan, 2005) to include aggregation operation and look at how it affects memory consumptions in a mobile environment. This paper is organized as follows. First, we provide some background review followed by our previous work in the research area. Then, we describe our proposed techniques for processing mobile queries with a set of walk-through examples. After that, we discuss the results of our performance evaluation. Finally, we provide a summary, and conclude with future work.

BACKGROUND

With the increasing popularity of using mobile devices in daily life, we can see that there is a great pressure on most current e-commerce models to expand their business and cater to mobile users (Kebin et al., 2008). With limited screen size and processing power of a mobile device, efficient query processing should be a concern. Successful m-commerce providers are aware that long processing time will result in loss of customers. As such, providers must take a look at unique characteristics of m-commerce and how these characteristics differ from those of e-commerce. To develop truly convincing services to users, providers cannot simply replicate current e-commerce models to m-commerce environment.

Recent related work done by others in the field of mobile database queries includes processing query via server strategy, on-air strategy, and client strategy. Figure 1 gives an illustration of the three strategies of query processing in a mobile environment.

The server strategy refers to the scenario where mobile users send a query to the server for processing and then the results are returned to the users (Prabhakara, Hua, & Jiang, 2000; Waluyo, Srinivasan, & Taniar, 2005). Issues, such as location dependency, will be taken into account since different locations will be accessing different servers, and subsequently processing are done in the server and the return of the results will be based on the new location of the mobile users (Jayaputera & Taniar, 2005). Issues, such as location dependency, will be taken into account since different locations will be accessing different servers, and subsequently processing are done in the server and the return of the results will be based on the new location of the mobile users (Jayaputera & Taniar, 2005).
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